Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

CONFIDENTIAL

02288

INTERIM TEST AND EVALUATION REPORT

1540 SPLIT FORMAT LIGHT TABLE

WITH MOUNT FOR VARIOUS MICROSCOPES

(PROTOTYPE)

Declass Review by NGA.

CONFIDENTIAL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8
CONFIDENTIAL

INTERIM TEST AND EVALUATION REPORT

1540 SPLIT FORMAT LIGHT TABLE

WITH MOUNT FOR VARIOUS MICROSCOPES

(PROTOTYPE)

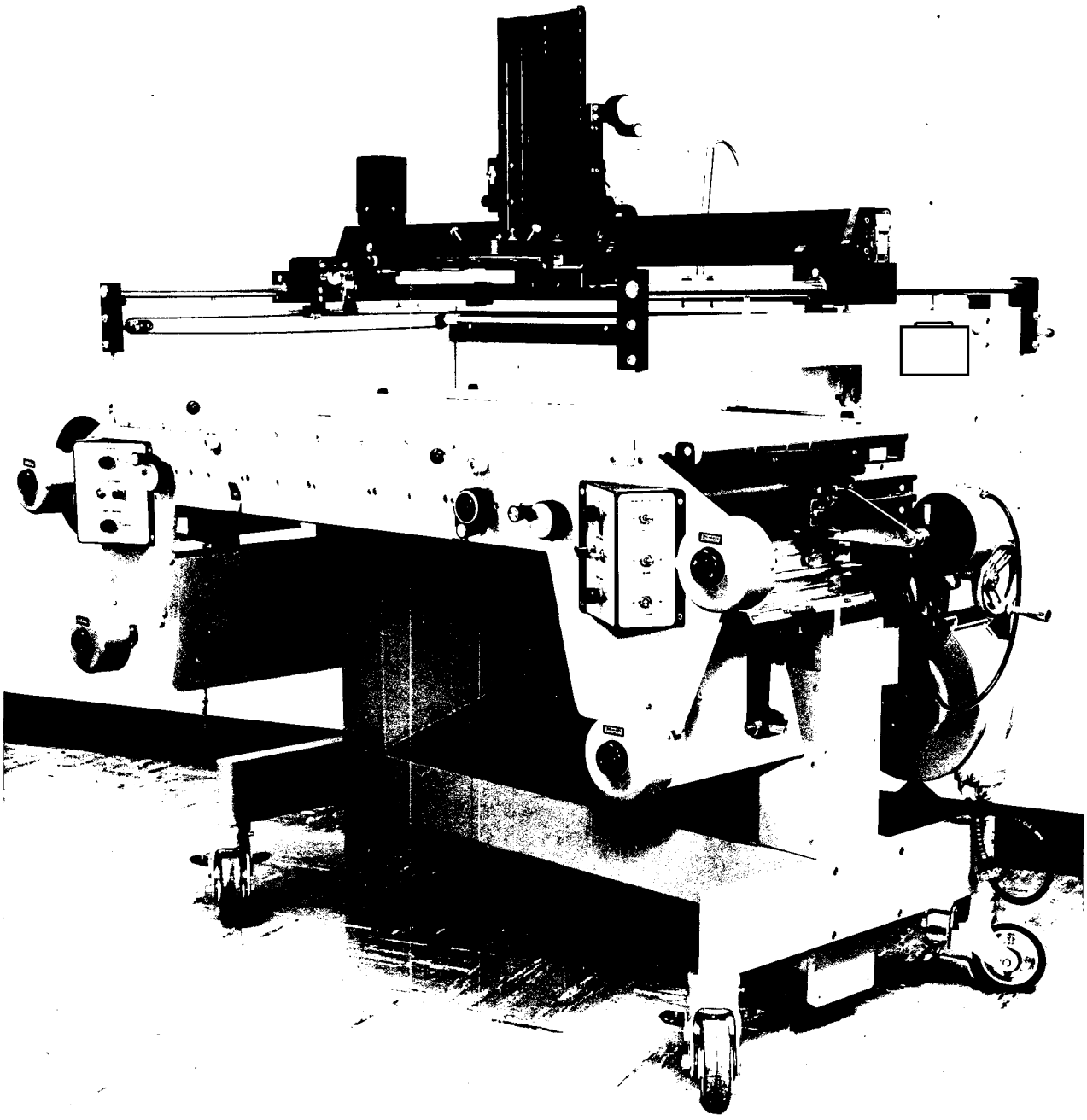
April 1969

5X1

Test & Evaluation Branch
ESD/TSSG/NPIC

CONFIDENTIAL
Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8



25X

SPLIT-FORMAT 1540 LIGHT TABLE (PROTOTYPE)

FIGURE 1

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8
CONFIDENTIAL

TABLE OF CONTENTS

		PAGE
1.	INTRODUCTION	1
2.	CONCLUSIONS AND RECOMMENDATIONS	2
3.	TEST RESULTS	3
	3.1. Physical Requirements	3
	3.2. Reliability	8
	3.3. Maintenance	8
	3.4. Graphic Requirements	9
	3.5. Human Factors	9
4.	ENGINEERING EVALUATION AND OBSERVATIONS	10

LIST OF FIGURES

1. Split Format 1540 Light Table (Prototype)
2. Light Output - Left Stage
3. Light Output - Right Stage
4. Light Distribution - Left Stage
5. Light Distribution - Right Stage
6. Low Light Intensity Flicker Output
7. Warm-up Characteristics - Left Stage
8. Warm-up Characteristics - Right Stage
9. Parallelism of Carriage to Working Surface - Left Stage
10. Parallelism of Carriage to Working Surface - Right Stage
11. 1540 Light Table (Prototype) Noise Curve
12. 1540 Light Table Rear View with Access Doors Open

CONFIDENTIAL
Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

INTERIM TEST REPORT

1540 SPLIT-FORMAT LIGHT TABLE WITH MOUNT FOR VARIOUS MICROSTEREOSCOPE (PROTOTYPE)

1. INTRODUCTION

1.1. The Split-Format 1540 Light Table with mount for various microstereoscopes was built by the [redacted] 25X This 1540 table was tested by TEB between 10 February 1969 and 10 March 1969. The Development Objectives for the 1540 Light Table were used as a guidline for the acceptance tests. Engineering tests were also performed on the equipment in order to determine additional performance characteristics.

1.2. The maximum light output, after stabilization, was found to be below specifications. On 28 March 1969, a representative of the [redacted] 5X1 increased the light output intensity to 3000± 50 FL. It is felt by the evaluator, that the equipment now meets the development objectives for maximum illumination level. The illumination output level adjustments are now set at maximum output. The test results and data shown in the report were compiled prior to achieving the increase in light output and consequently, does not reflect this change.

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8
CONFIDENTIAL

2. CONCLUSIONS AND RECOMMENDATIONS

2.1. TEB concludes that with the exception of the excessive light fall off, film drive, hand crank operation and the problem of film scratches caused by the segmented rollers, the prototype equipment design is basically sound. The additional faults that were found can be corrected by relatively simple engineering modifications.

2.2. It is the opinion of the evaluator that the film drive motor, drive motor amplifier circuitry and film tensioning scheme used in this equipment is of sound design and should be retained. However, the hand crank (tach generator) system for the slow movement of the film should be changed to a more suitable arrangement.

CONFIDENTIAL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

CONFIDENTIAL

3. TEST RESULTS

3.1 PHYSICAL REQUIREMENTS

ITEM	TEST RESULTS	DESIGN OBJECTIVES AND/OR REQUIREMENTS
3.1.1 External dimensions	57.5 inches long, 35 inches wide; the light box is 5.5 inches deep.	Approx. 58 inches long incl. film supports, 30 inches wide, light box $\leq$ 5.5 inches deep.
3.1.2 Weight	600 $\pm$ 25 lbs.	Light as possible without sacrificing stability.
3.1.3 Power	Meets all requirements.	Operates on 115 +10 to 15 -10 to 15 V. 60 HZ, Single phase. Proper fusing, and spare fuse located next to each fuse holder. Retractable 3 conductor extention cord supplied.
3.1.4 Illumination Sources		
3.1.4.1 Stage Size	Each stage is 14.5 X 19.75 inches - combined length is 40.55 inches.	Two 15 X 20 inch glass formats (Viewing surfaces) combined length $\cong$ 40 inches.

CONFIDENTIAL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

ITEM	TEST RESULTS	DESIGN OBJECTIVES AND/OR REQUIREMENTS
3.1.4.2 Illumination Level (Foot-Lamberts)		
Maximum Brightness	Left Stage = 2675 F.L. Right Stage = 2580 F.L.	≧ 3000 F.L. after 4 hours of operation or stabilization. Meas. at Geometric Center of stage. Max. levels will not differ more than 100 F.L.
Minimum Brightness	Left Stage = 95 F.L. Right Stage = 104 F.L.	< 75 F.L.
Illumination Control Interactions	Left Stage = Δ 100 F.L. Right Stage = Δ 140 F.L.	Maximum level of Stage illum. will vary by no more than 100 F.L. when other stage illum. is adjusted full range.
Uniformity of Illumination (Brightness Gradient)	Exceeded limits on both stages. See Figures 2 & 3.	Will not exceed 33% between any two points on stage.
3.1.4.3 Flicker	Flicker of 4-5 HZ was detected on each stage. See Figure 6.	Flicker frequency ≧ 60 HZ at low illumination. >80 HZ at higher illuminations.
3.1.4.4 Heat	Δ T. Left stage = 29.9°F. Δ T. Right stage = 30.4°F. See figures 7 & 8	Viewing platen temp. will not >30°F. over ambient with 2.0 density film covering stage.
3.1.4.5 Adjustable shade	Meets Requirement.	An adjustable shade at each of the illumination sources to mask out all areas not covered by film.

CONFIDENTIAL

CONFIDENTIAL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

ITEM	TEST RESULTS	DESIGN OBJECTIVES AND/OR REQUIREMENTS
3.1.5 Film Handling System		
3.1.5.1 Film Looping Capability	Forms a 77.5 inch film loop.	Capable of forming a film loop ≧ 76 inches.
3.1.5.2 Film Spool Supports		
General	Meets requirement.	Must be able to hold full spools of film when spools are rotating at 500 R.P.M.
Loading Mechanism	Meets requirement.	Quick, Positive action.
Spindle Mechanism	Meets requirements.	Must be able to activate holding mechanism with one hand while holding full spool of film in other hand. Must incorporate a positive quick release lock.
Brackets	Detents do not allow accurate positioning of brackets (See engineering evaluation & observation section).	Visible Ref. Scale & Indexing device w/positive detents to allow accurate positioning of brackets.

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

ITEM	TEST RESULTS	DESIGN OBJECTIVES AND/OR REQUIREMENTS
3.1.5.3 Film Drive		
Film Tension	No evidence of film damage or formation of slack loops were noted during any of the film handling tests. Approx. 1 in/LB. of torque is applied at the film drive.	Must maintain adequate film tension to prevent formation of slack loops at all speeds and conditions of operation. Must not damage film.
Film Movement	Tachometer-generator handwheel design provides variable ratio voltage output to motors. The output is a function of the speed of handwheel rotation. It is impossible to drive both rolls of film simultaneously with one handwheel. The motor drive will translate 500 ft. of 9.5" film in all viewing modes in less than 57 seconds.	Bi-directional movement of the films through a 1:1 ratio handwheel and/or a suitable size motor. In parallel viewing mode, it shall be possible to drive both rolls of film simultaneously w/one handwheel.
3.1.5.4 Rollers	Outboard segmented rollers rapidly scratched the film emulsion at points of segmentation. (emulsion down) Misaligned inboard rollers caused film to "weave" and consequently tear during rapid translation in "two camera" and "film loop modes".	Minimum number of separate rollers must be positioned so that film can be transported either emulsion up or emulsion down without scratching film surfaces.

CONFIDENTIAL

CONFIDENTIAL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

ITEM	TEST RESULTS	DESIGN OBJECTIVES AND/OR REQUIREMENTS
3.1.6 Micro-stereoscope Mounting System (Tests Performed with 14 lbs. simulated weight on optics mount)		
3.1.6.1 Focus Controls	The course and fine focus controls operated smoothly. No evidence of backlash was noted.	Smooth acting w/minimum play between mechanism and hand controls.
3.1.6.2 Carriage Translation	Y direction = 18.87" X direction = 28.25" The distance between the micro-stereoscope mount and the surface of the stages varies by .009 inches over both the left and right stages. (See figures 9 and 10).	Y direction ≧ 15 inches X direction max. commensurate w/small length dimension. Must be designed so that microstereoscope may be moved over entire field without refocusing the optics.
3.1.6.3 Carriage Motions	With 14 pounds of simulated weight, the carriage moved smoothly with no evidence of binding in any combination of X and Y directions. A force <2 lbs. was required to move the carriage over the range of X travel.	Low friction co-efficient, smooth, positive acting, a force ≦ 2 lbs. sufficient to move in any combination of X and Y directions.
3.1.6.4 Carriage Locks	A force ≧ 14 lbs. is required to move the carriage over the Y travel. A force >7 lbs. but <9 lbs. is required to move the carriage over the X travel.	A force ≧ 10 lbs. required to move the carriage in any combination of X and Y directions.

CONFIDENTIAL

CONFIDENTIAL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

ITEM	TEST RESULTS	DESIGN OBJECTIVES AND/OR REQUIREMENTS
3.1.6.5 Mount Rigidity	No self-induced vibrations were noted when viewing with 2 X rhomboids. No significant vibrations were noted on the loaded mount.	When using highest magnification and longest rhomboid relay system, no visible vibration will be induced by the light table.
3.2 Reliability	The light table was operated by TEB for 72.4 hours without failure. A defective temperature sensor caused the over temperature warning light to illuminate.	Light table is required to operate under real or simulated conditions for 500 hours without failure.
3.3 Maintainance	All internal components were accessable throughout machine. No specific test points are available. Circuit diagram is conveniently located inside rear access door. Heavy access door (panel) containing high voltage power supply transformers requires an appropriate warning attached thereon. (See figure 12).	Convenient access to internal components effected by strategic location of cover panels and plates. Electronic circuit test points available at necessary points. Circuits diagram will be mounted inside access panel.

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

ITEM	TEST RESULTS	DESIGN OBJECSIVES AND/OR REQUIREMENTS
3.4 Graphic Requirements	The operation/maintainance manual meets the general requirements for an operators manual. However, it contains insufficient data in the maintainance portion. Servicing, removal & replacement procedures, repair procedures, & parts lists were left out of the manual.	The Manual will be prepared in accordance with DB-1003.
3.5 Human Factors		
3.5.1 Noise	The equipment noise energy levels fall below the limits of the NC-40 curve (See figure 11).	Maximum equipment noise energy levels shall not exceed the noise criteria 40 curve as set forth in Mil-std. 803 A-2 USAF.
3.5.2 Viewing Position	Changing the table from a lowered to a raised position changes the viewing height by $17\frac{1}{2}$ inches. The The knee clearance with the Table lowered is 25 inches.	Comfortable use in a seated or standing position minimum knee clearance $\leqq$ 25 inches.
3.5.3 Location of Controls	Controls appear to be placed correctly. The color of the over temperature indicator lamp should be changed so that it can be more easily differentiated from the on-off lamp.	Controls positioned for easy manipulation.
3.5.4 Safety	All safety requirements were met in the design of the light table.	External metal parts grounded. Moving mechanical parts enclosed. Sharp edges or corners to be avoided. Ventilating exhaust away from operator.

CONFIDENTIAL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8
CONFIDENTIAL

4. ENGINEERING EVALUATION AND OBSERVATION

4.1. The external dimensions of the light boxes are 20.25 inches long, 16.25 inches deep and 5.5 inches high. With the light table raised, the distance from the top of the light box to the floor is 48.25 inches. With the table lowered, the distance is 30.75 inches.

4.2. The time required to raise the table is 39 seconds, while the table can be lowered in 37 seconds.

4.3. The amount of current required at an input of 117 VAC to operate the table, with maximum illumination and two film motors operating, is 10.5 amperes. At 107 VAC, the current required for operation is 8.3 amperes, and at 132 VAC the current required is 10.5 amperes.

4.4. The illumination source power supply appears to be well regulated, i.e. a change of input voltage from 107 to 132 VAC produced no detectable change in the maximum light intensity output.

4.5. The film transport system utilizes Inland Model NT 2916A Motors, which produce a no load output of 600 R.P.M. when 90 VAC is applied. These motors are capable of producing 7.2 inch-pounds of torque when measured at an empty film reel.

4.6. It is difficult to obtain a smooth film movement at slow speeds from the film hand crank and to accurately position the film at the desired location. This problem is due to an erratic D.C. voltage output from the tachometer-generator when its shaft is rotated slowly. This erratic signal is then applied to the film drive motors through solid state amplifiers.

4.7. The spring loaded film bracket positioning plungers, which are located on the reel brackets, cannot position the brackets accurately.

4.8. The center idler reel bracket was easily bent during tests. This caused the bracket to rub the end of the film spool.

4.9. The small steel rollers located between the viewing stages are misaligned. This results in the film wandering over the edge of the rollers and onto the roller retainer when film is translated in the "two camera" and "dead loop" modes. Consequently, the film is scratched and torn. With the stage closed, the forward distance between the rollers is 0.088 inches and the aft distance is 0.150 inches.

4.10. The light box bottom cover vibrates when the film is translated rapidly in the "two camera" and "dead loop" modes.

4.11. It requires .625 ft./lb. to open and close the stage with the shifting handle. The stage should be opened at least .85" when translating film in the "two camera" or "dead loop" mode.

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8
CONFIDENTIAL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

4.12. The course focus control requires 7.7 turns, and the fine focus control requires 15.4 turns in order to translate the microstereoscope pod holder 1 inch in the Z direction. The fine focus control provides 3.5 inches of Δ Z.

4.13. The maximum traverse speed of the carriage motorized drive is .272 inches/sec. in the X direction and .268 inches/sec. in the Y direction.

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

CONFIDENTIAL

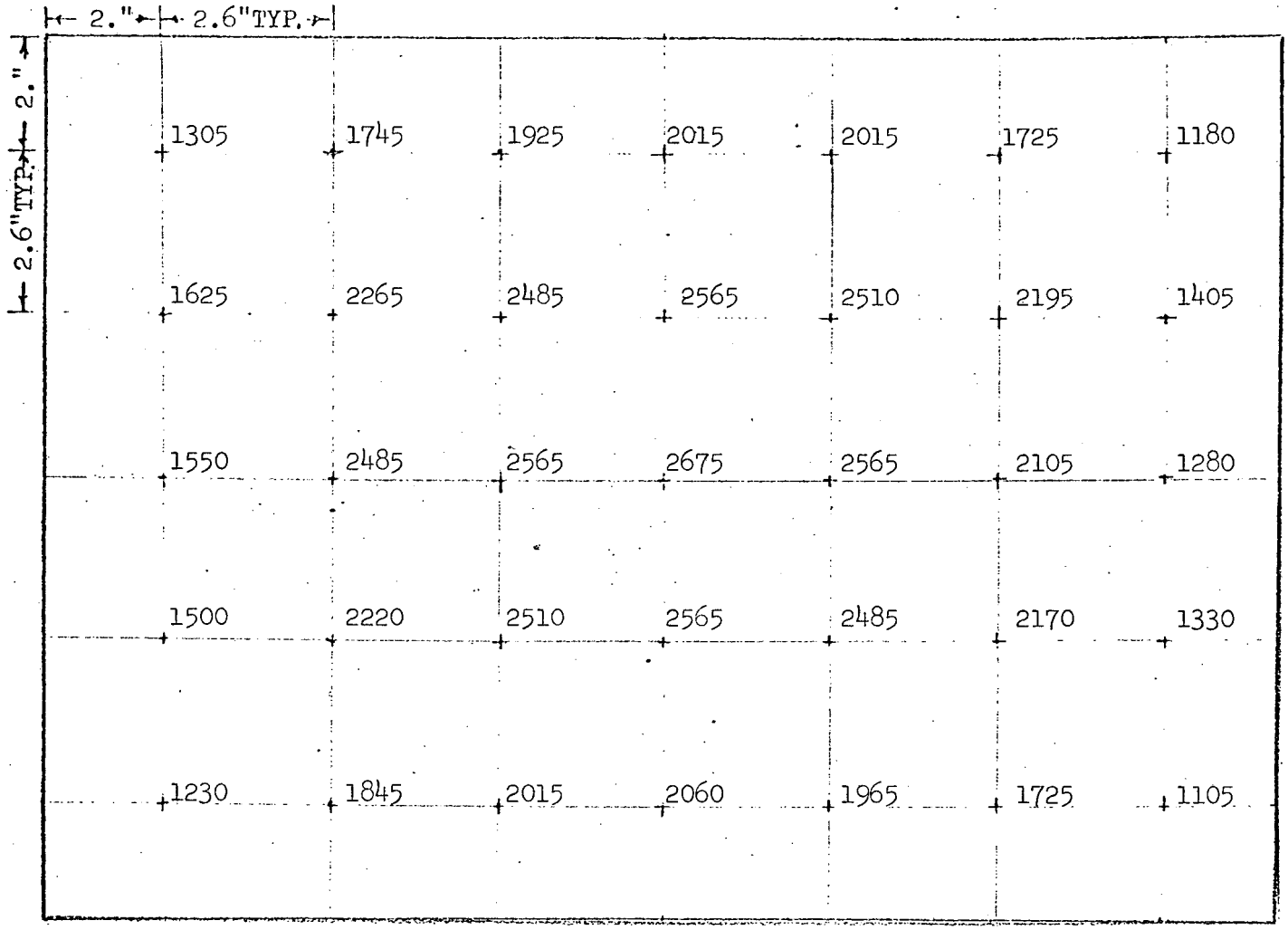
DISTRIBUTION

1 - EX. SEC./EXRAND
1 - DIA/DIAAP-9C2
1 - Ch/ARMY/SPAD
1 - DIR/IAS/DDI
1 - Ch/OSS/IEG
1 - Ch/PPS/TSSG
1 - DED/TSSG [redacted] 25X
3 - TEB/ESD/TSSG

CONFIDENTIAL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8



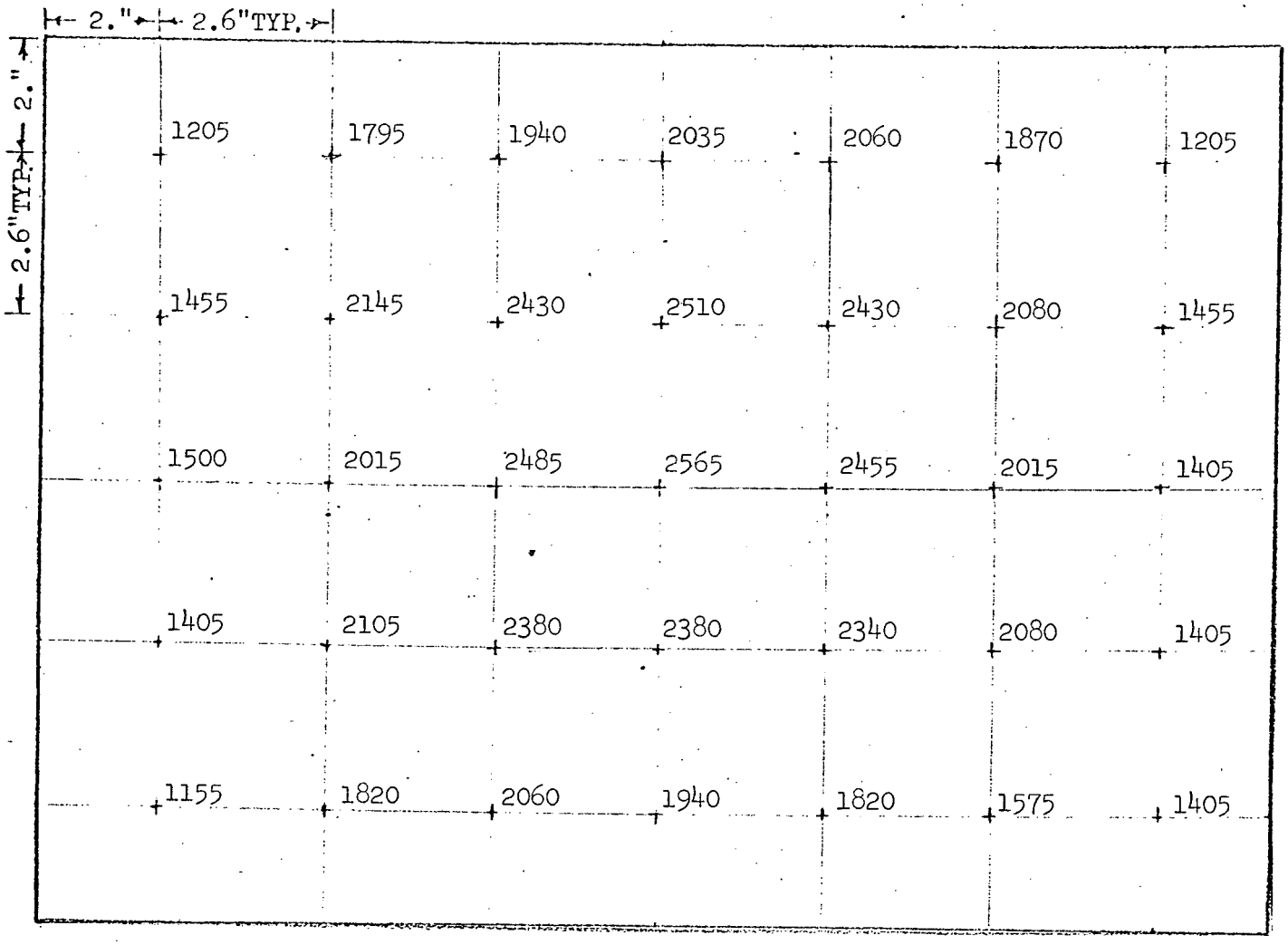
LIGHT OUTPUT - LEFT STAGE

Notes: 1. Readings in Foot Lamberts.
2. Readings taken after Stabilization.
3. Scale 1:3

FIGURE 2

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8



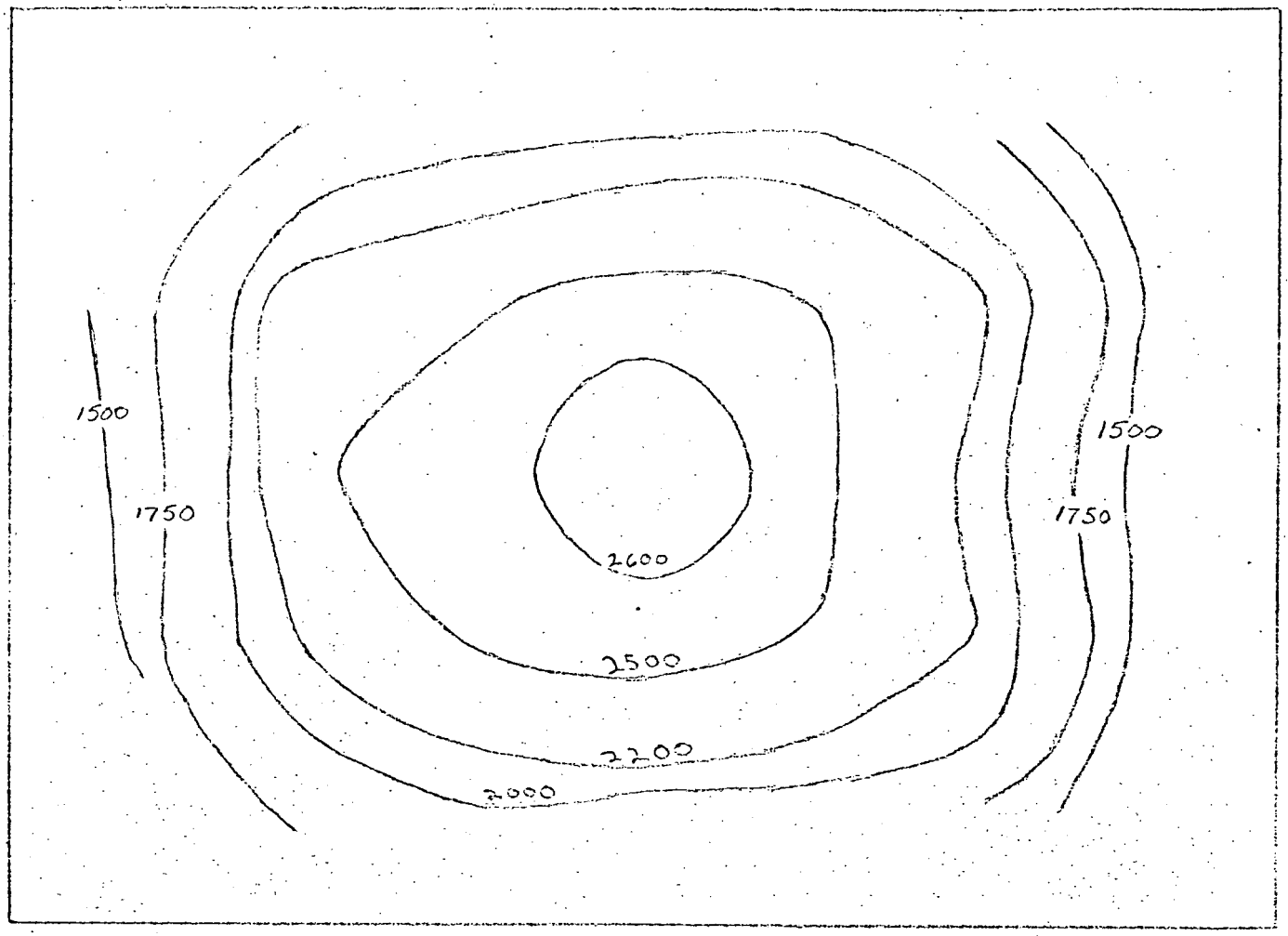
LIGHT OUTPUT - RIGHT STAGE

NOTES: 1. Readings in foot-lamberts.
2. Readings taken after stabilization.
3. Scale 1:3.

FIGURE 3

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8



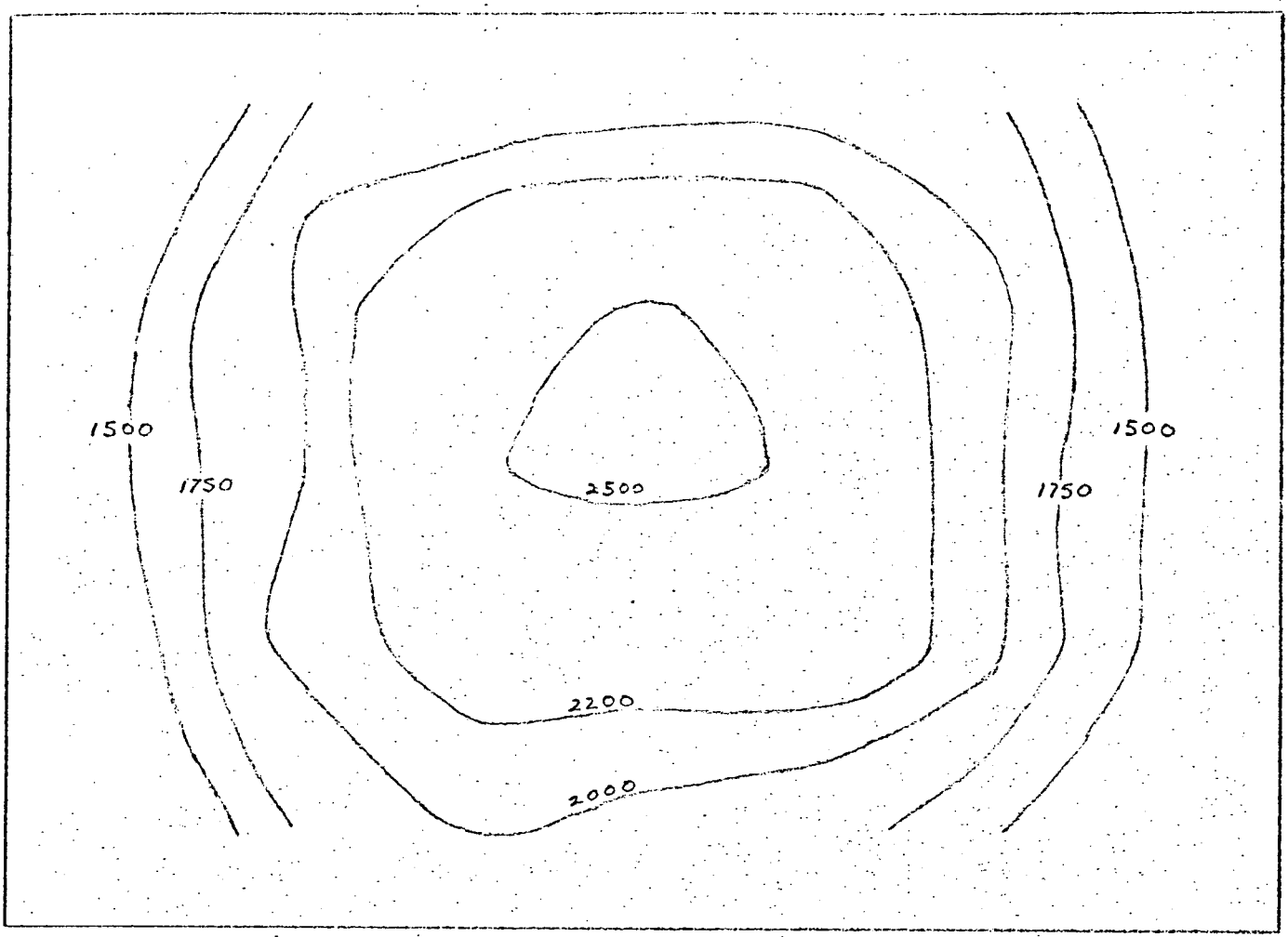
LIGHT DISTRIBUTION - LEFT STAGE

NOTES: 1. Readings in foot lamberts.
2. Readings taken after stabilization.
3. Scale 1:3

FIGURE 4

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8



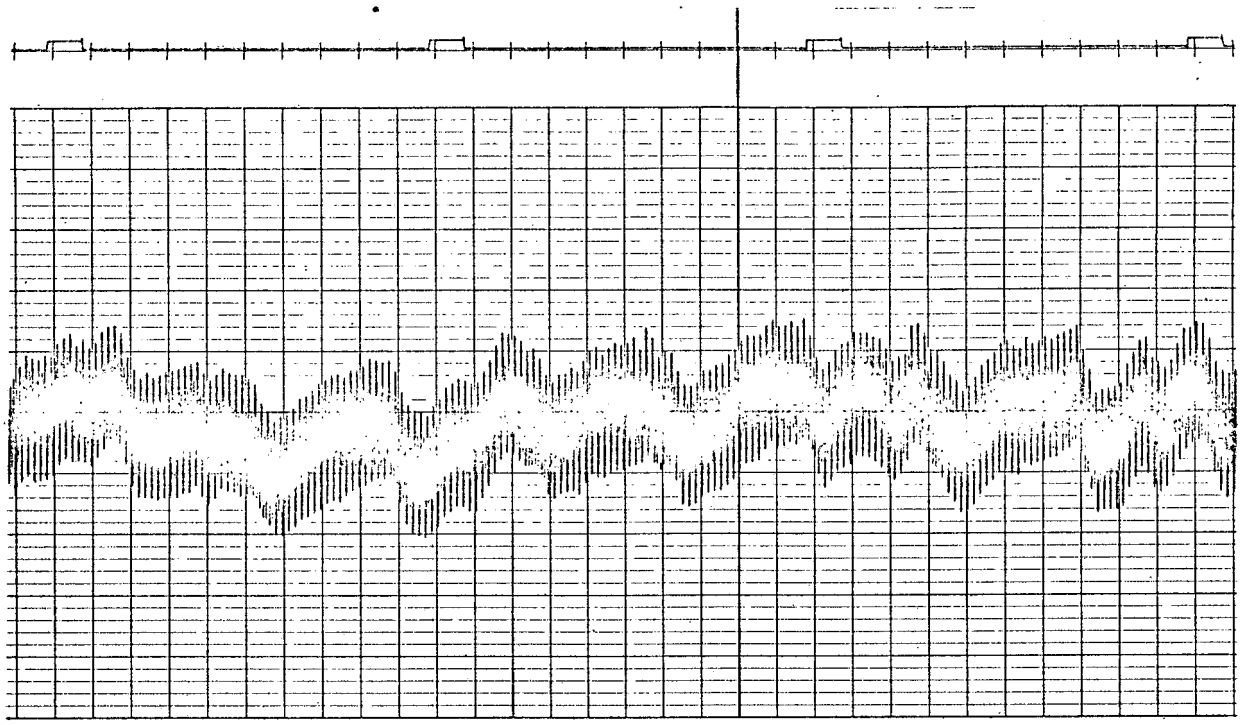
LIGHT DISTRIBUTION - RIGHT STAGE

NOTES: 1. Readings in foot-lamberts.
2. Readings taken after stabilization.
3. Scale 1:3

FIGURE 5

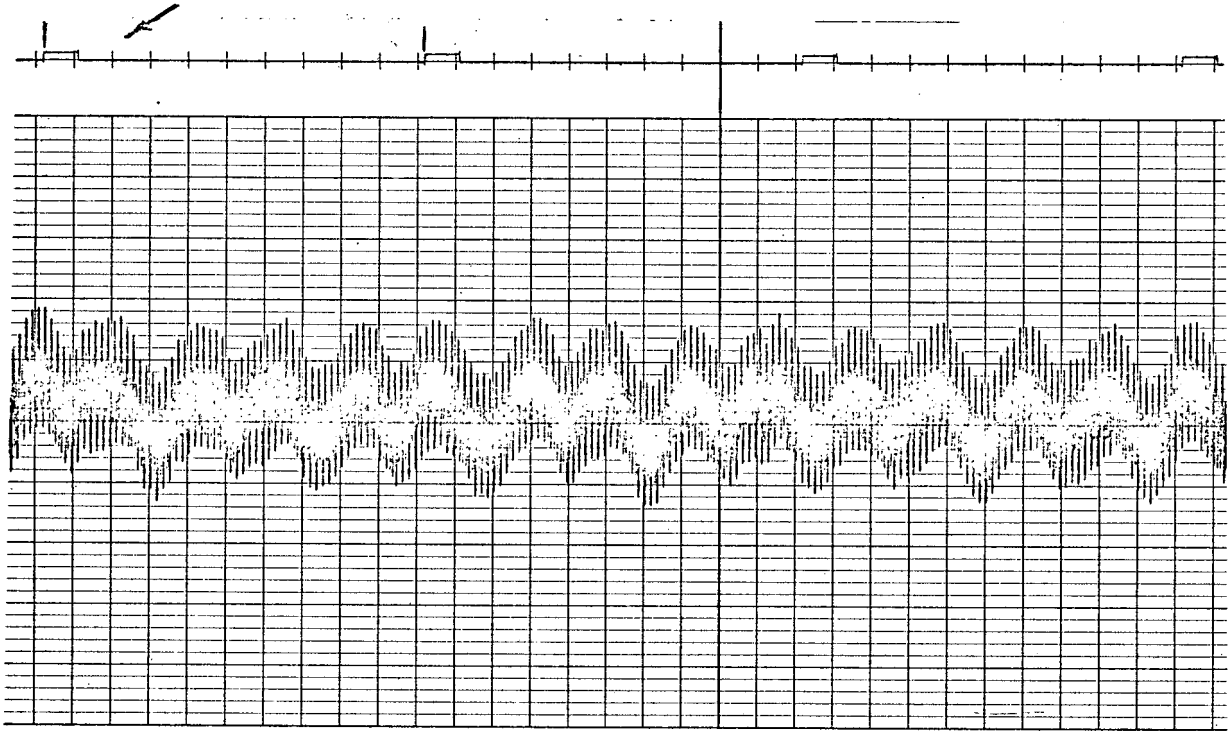
Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8



LEFT STAGE

1 sec. Time Marker



RIGHT STAGE

LOW LIGHT INTENSITY FLICKER OUTPUT

1540 LIGHT TABLE

FIGURE 6

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

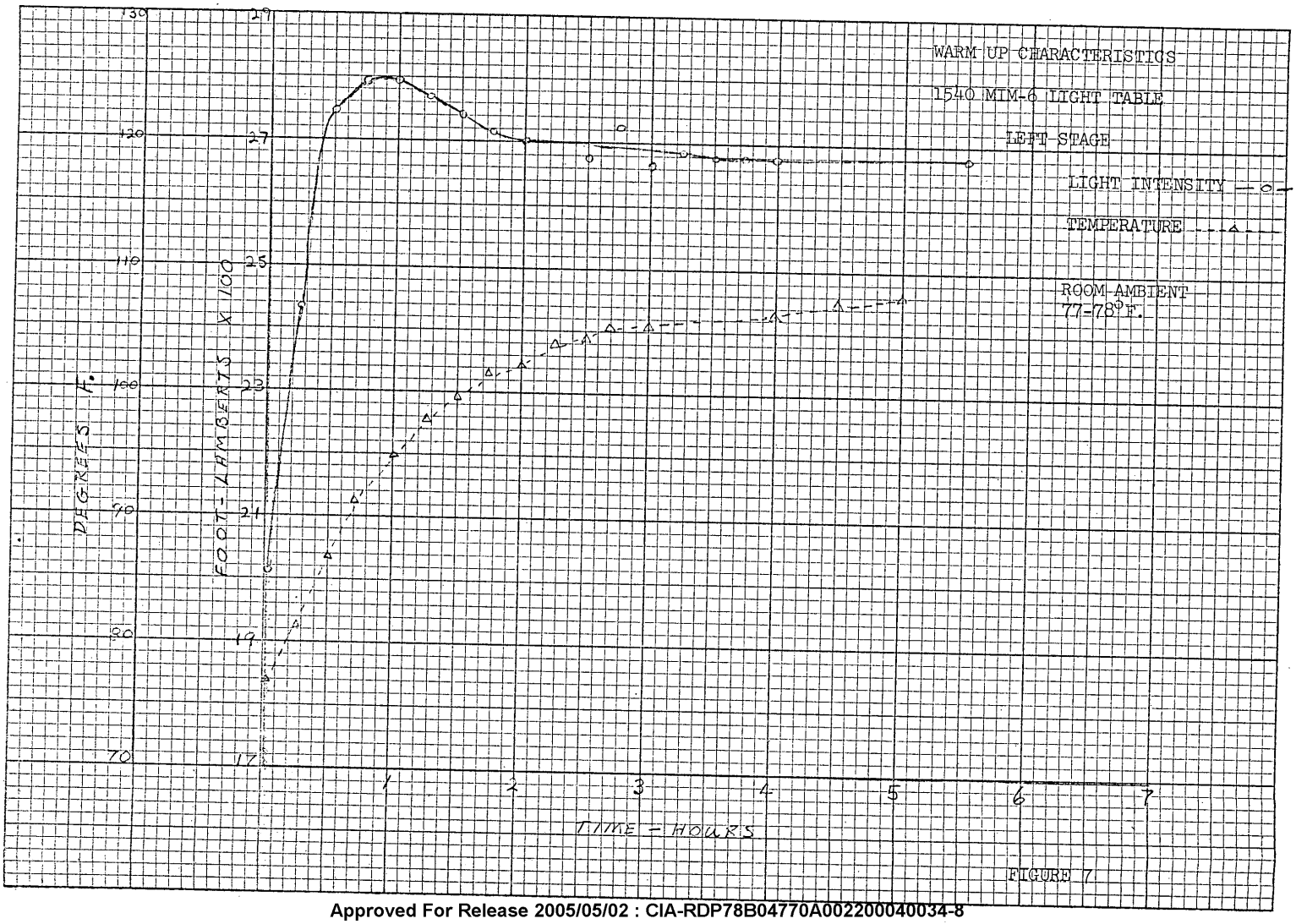


FIGURE 7

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

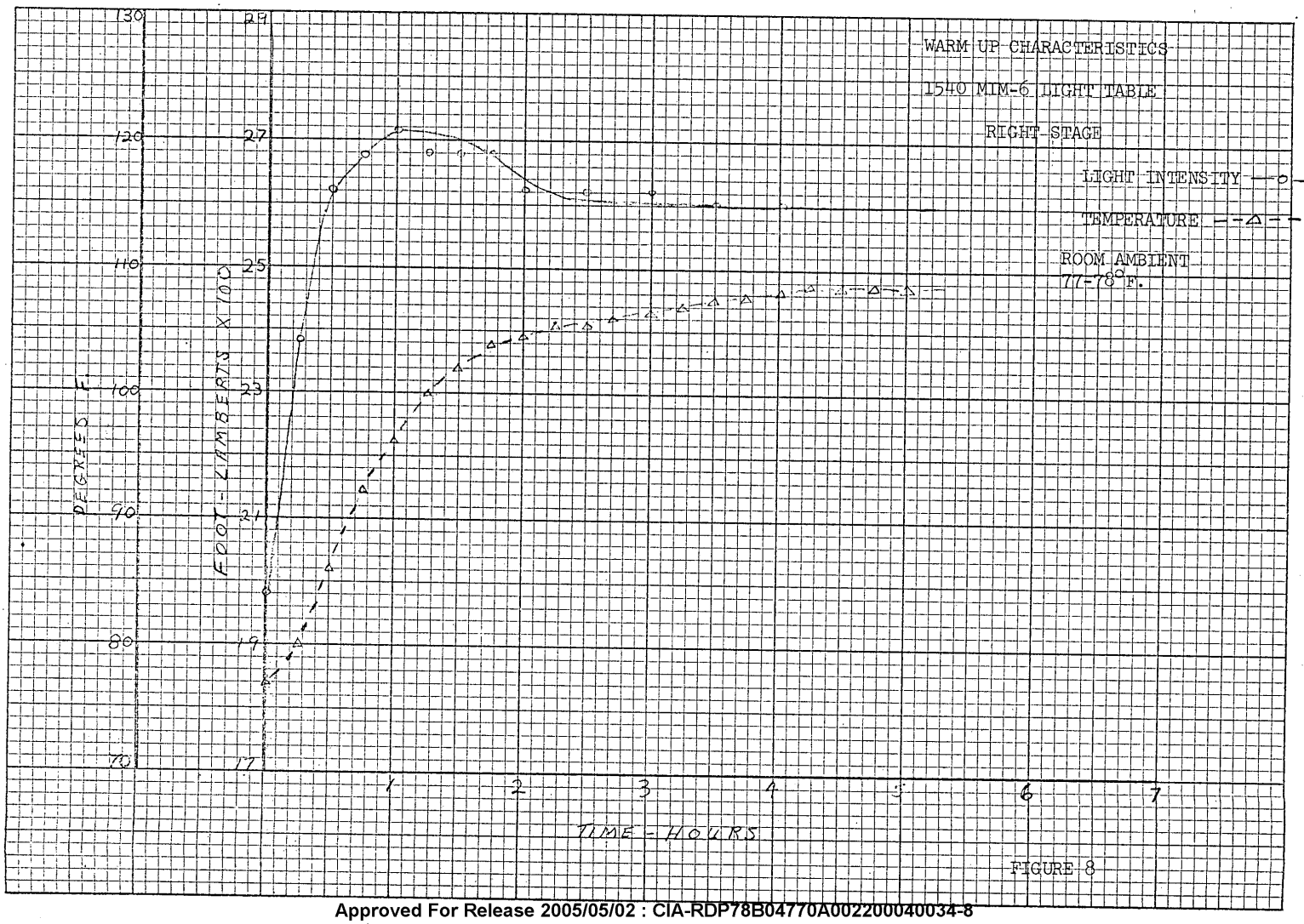
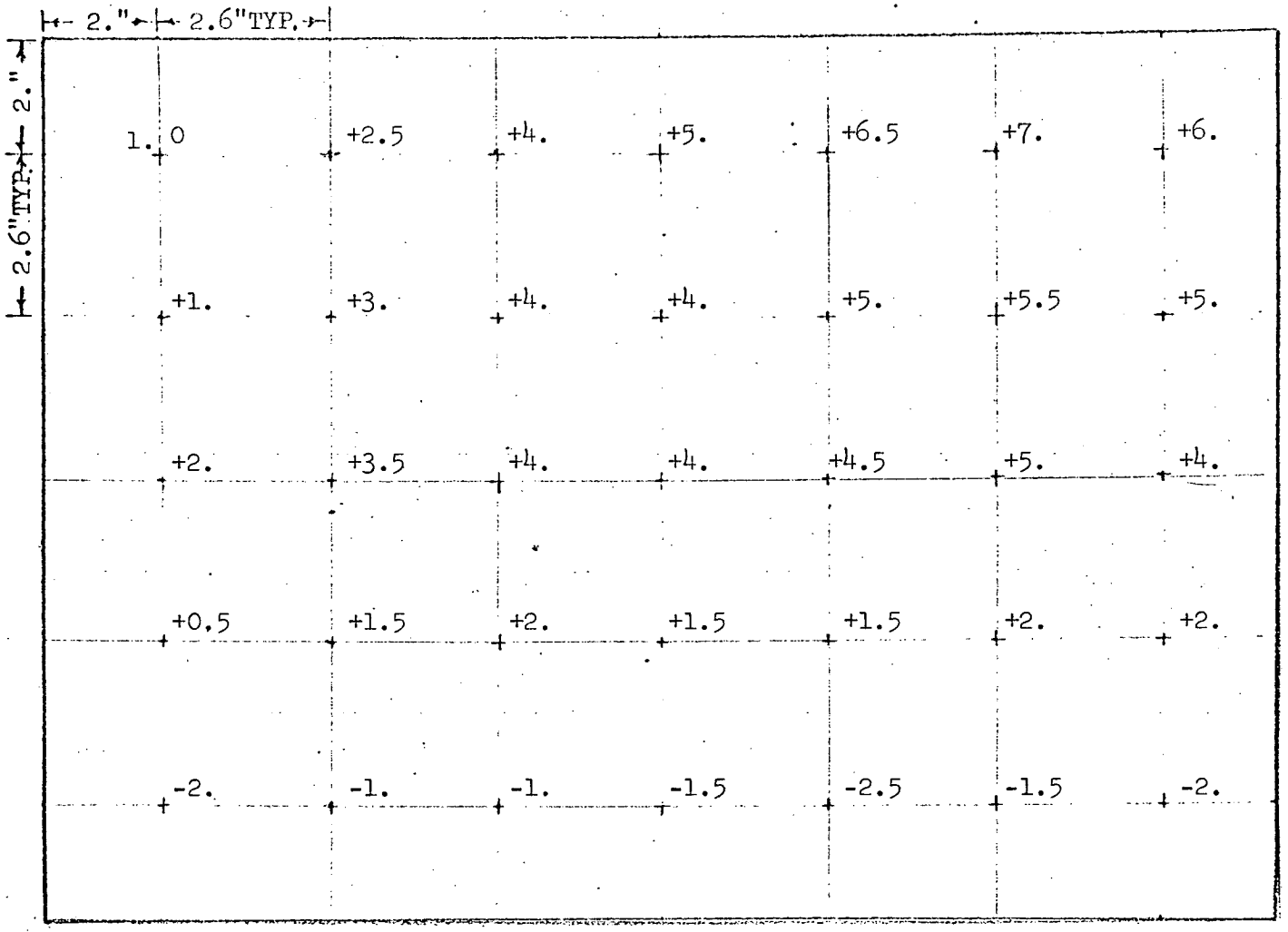


FIGURE 8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8



PARALLELISM OF CARRIAGE TO WORKING SURFACE

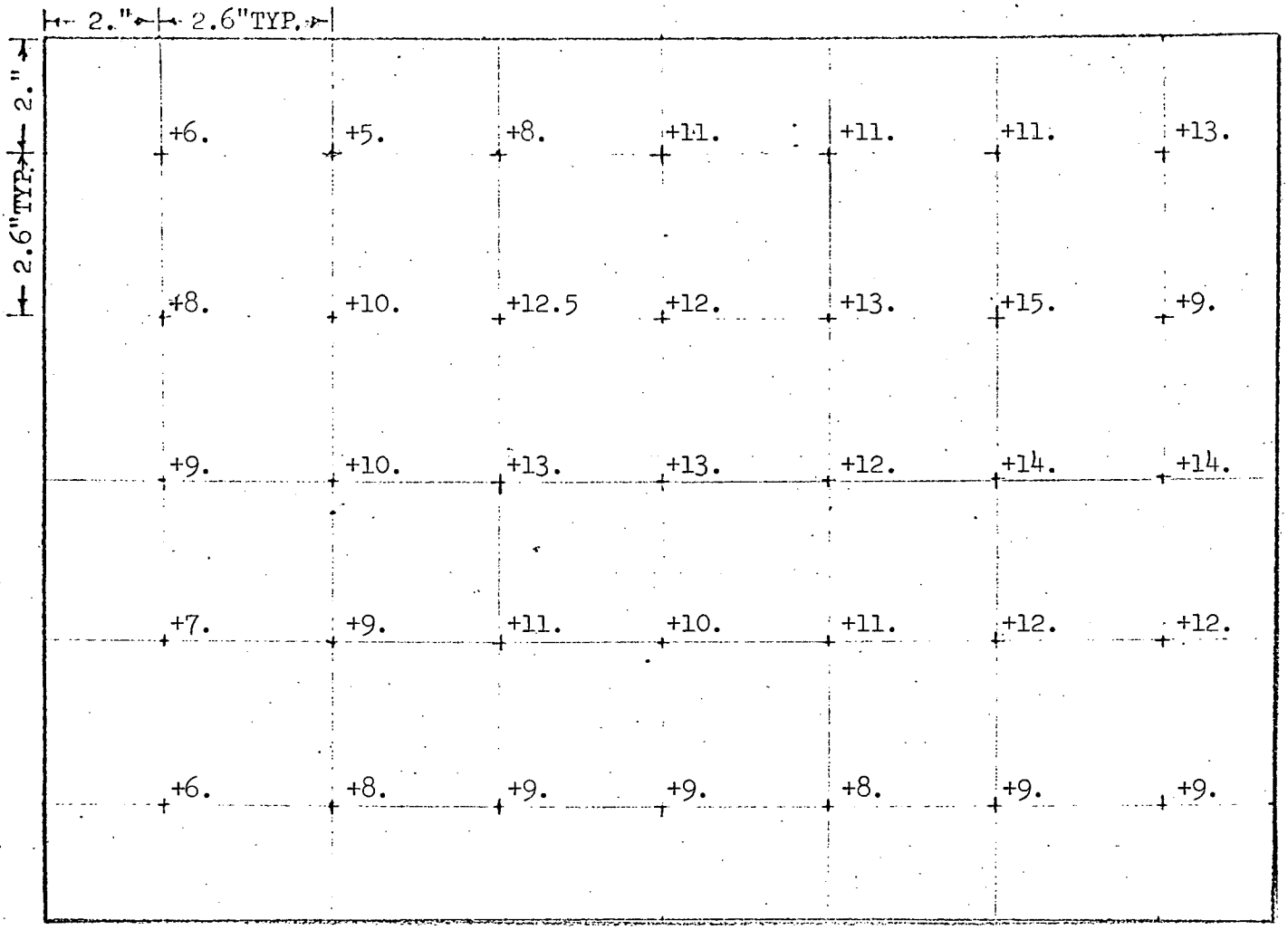
LEFT STAGE

NOTES:
1. Readings are X .001 inches.
2. + Readings are above zero.
   - Readings are below zero.
3. All readings relate to point 1. (TOP LEFT) on left stage.
4. Optics holder loaded w/max simulated wt. (14 lbs)

FIGURE 9

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8



PARALLELISM OF STAGE TO WORKING SURFACE

RIGHT STAGE

NOTES:
1. Readings are X.001 inches.
2. + Readings are above zero.
   - Readings are below zero.
3. All readings relate to point 1. (TOP LEFT) on left stage.
4. Optics holder loaded w/max simulated wt. (14 lbs)

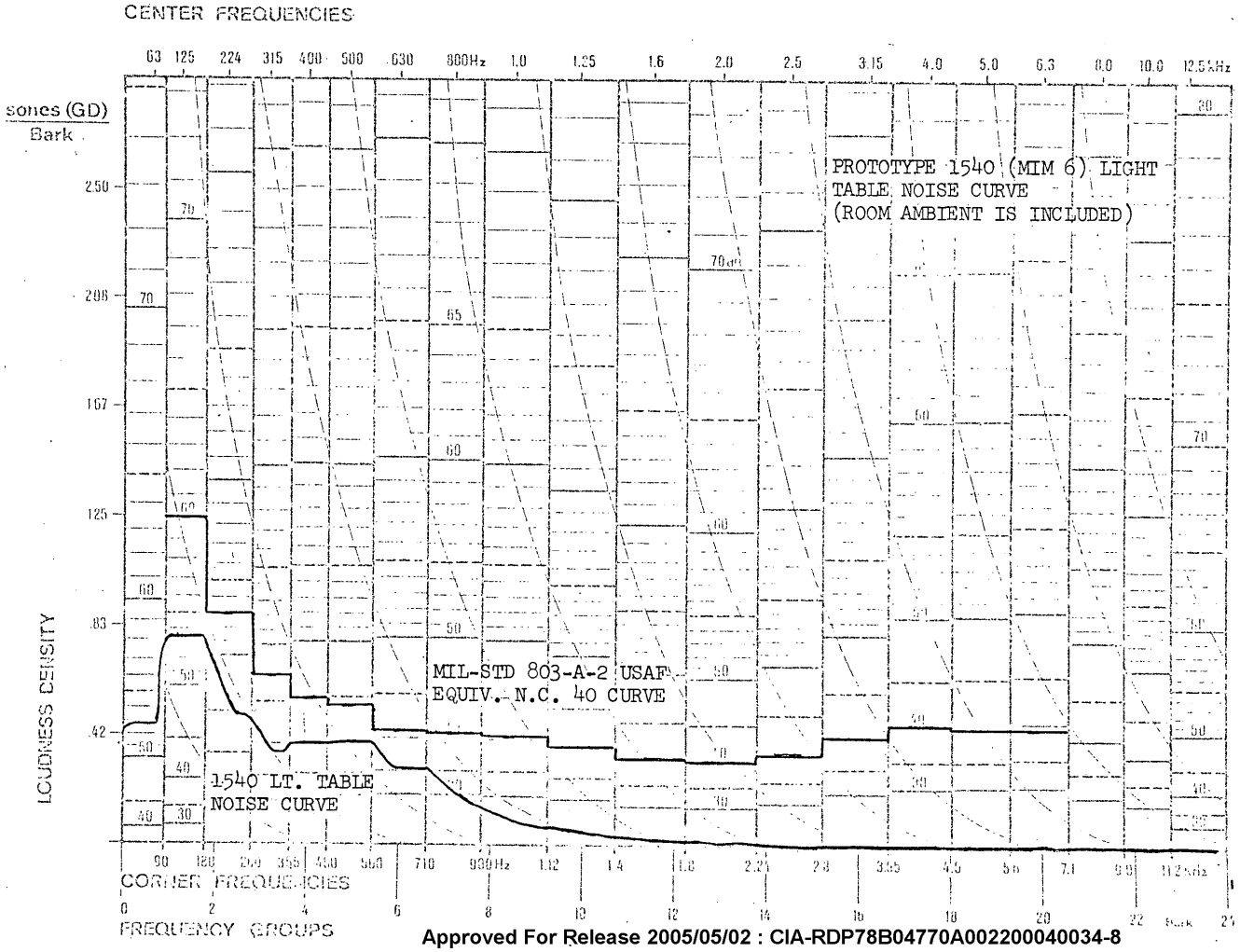
FIGURE 10

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

25X1

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

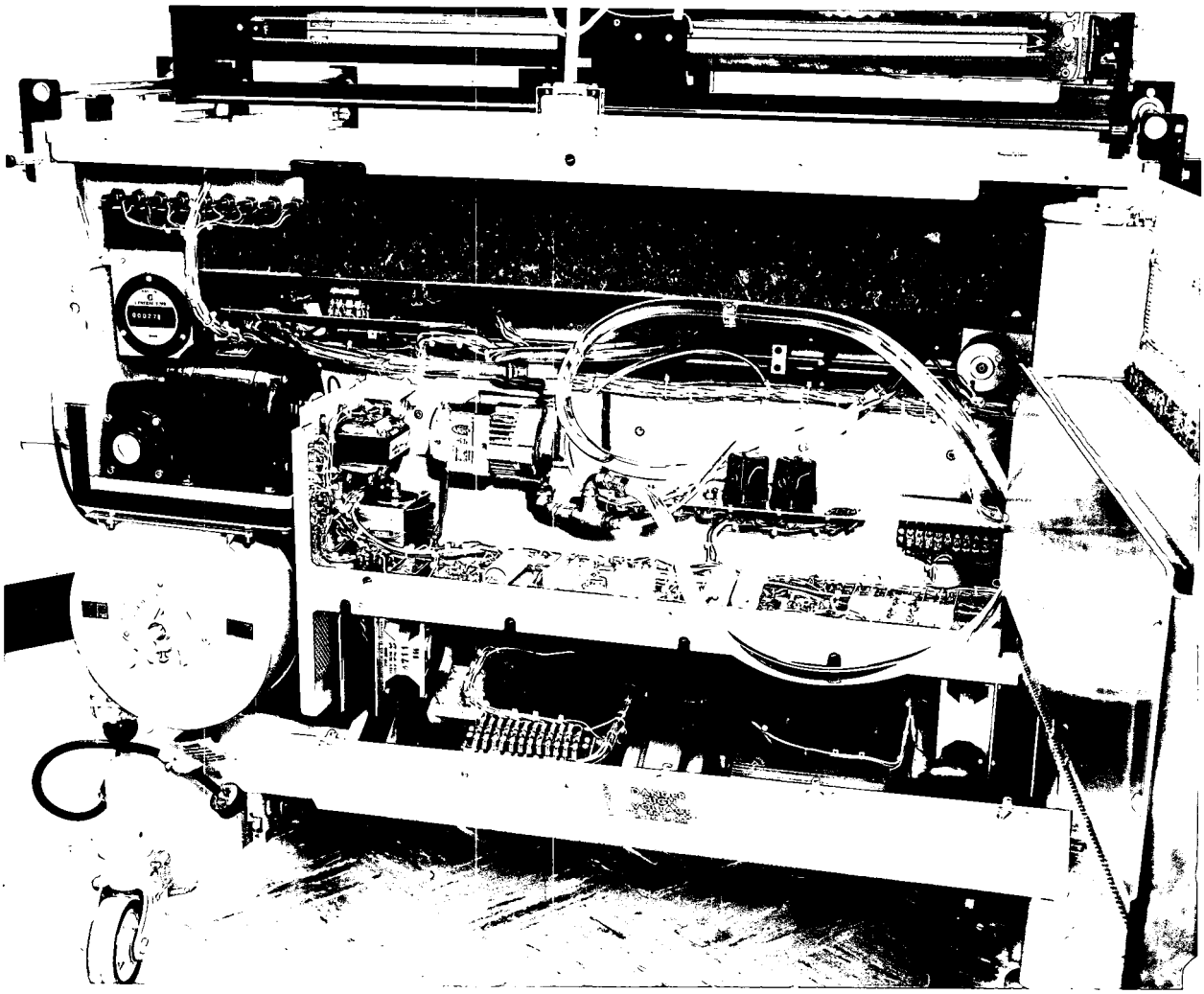
3051A RANGE: 40 sones
SOUND FIELD: DIFFUSE


CENTER FREQUENCIES
63 125 224 315 400 500 630 800Hz 1.0 1.25 1.6 2.0 2.5 3.15 4.0 5.0 6.3 8.0 10.0 12.5kHz
sones (GD)
Bark
PROTOTYPE 1540 (MIM 6) LIGHT TABLE NOISE CURVE (ROOM AMBIENT IS INCLUDED)
MIL-STD 803-A-2 USAF EQUIV. N.C. 40 CURVE
1540 LT. TABLE NOISE CURVE
LOUDNESS DENSITY
CORNER FREQUENCIES
FREQUENCY GROUPS
sones(GD) phons(GD)
LOUDNESS
LOUDNESS LEVEL

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8

FIGURE 11

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8



1540 LIGHT TABLE Rear View with Access Doors Open

FIGURE 12

Approved For Release 2005/05/02 : CIA-RDP78B04770A002200040034-8